DEQ in the Classroom:
Hey, We Need That!

IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY

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Grade Level:
Kindergarten – 5

Time Required:
45 minutes (can be longer or shorter depending on discussion), plus discussion time in weeks to come as class observes plants.

Objective:
Students learn that we need sunlight and clean air, water, and land (soil) to live.

Meets Idaho State Standards:
Grade K: K.S.1.6.1, K.S.3.1.1, K.S.3.2.1, K.H.1.1.11
Grade 1: 1.S.3.1.1, 1.S.3.2.1, 1.LA.6.1.1, 1.H.1.1.11
Grade 2: 2.SS.2.2.2, 2.S.1.2.1, 2.S.1.6.2, 2.S.3.2.1, 2.H.1.1.10
Grade 3: 3.S.1.2.1, 3.S.3.2.1, 3.LA.6.1.4, 3.H.1.1.10, 3.S.1.6.1, 3.S.1.6.2,
Grade 4: 4.H.1.1.10, 4.S.1.6.1, 4.S.1.6.2
Grade 5: 5.SS.2.2.1, 5.S.3.2.1, 5.H.1.1.8, 5.S.1.6.2

Meets standards in Science, Health, Language Arts, Social Studies

Focus:
Clean air, land, water. All living things (humans, animals, plants, fish, etc.) need sunlight and clean air, water, and land (soil) to live. Students observe plants that are deprived of their vital resources. Students learn the necessity of keeping these resources clean and what they can do to help.

Materials: (for a class of 25)
6 small, living, potted plants (label pots 1 – 6)
1 rock, 6 inches or more in diameter (large enough to be seen by entire class)
5 cups of soil in separate containers (reused yogurt containers work well)*
5 bottles of water (12-oz size works well; make sure lids don't leak!)*
5 opaque boxes with lids (rubber/plastic shoe boxes or tubs work well)*
Gravel – enough to fill one of the plant pots
Watering can
Zipper-type plastic bag, big enough to hold one plant pot with plant
Water
Distilled white vinegar (32 oz jar)
Paper towels and/or plastic bag

*****This can be done with fewer (or just one) cups of soil/bottles of water/boxes, but it will take longer as these items need to circulate around the class.

Background:

For life to exist, we need sunlight, clean air, clean water, and clean land/soil. Plants need all of these things for photosynthesis: carbon dioxide (air) and water combine during photosynthesis to make food, with sunlight being the energy source to make this happen. Plants get necessary minerals and nutrients from soil to live and grow so photosynthesis can take place.

Directly or indirectly, all living things rely on plants for food. Some living things eat plants (e.g., people eat lettuce; cows eat grass); other living things eat things that eat plants (e.g., people eat meat).

In addition, people and other animals need clean air to breathe, clean water to drink (and live in, for aquatic plants/animals), and clean land/soil to live on.

Pollution of the air, water, and land can compromise the life-supporting properties of these resources. By understanding the importance of clean air, water, and land, we can begin to learn why and how we need to keep them clean.

Students may point out that "clean dirt" is somewhat of a contradiction. Explain that the dirt/soil represents clean land. Also point out that while dirt is "dirty," by "clean" we mean not made dirty by people (not polluted). For example, "dirty" land/soil/dirt or water might have litter on/in it or something spilled on/in it (like paint or motor oil or soda).

Vocabulary:

Photosynthesis	The process in green plants (and certain other organisms) by which carbohydrates (food) are made from carbon dioxide (from the air) and water using light as an energy source.
Pollution	Something that contaminates (hurts, makes dirty) the natural environment; usually a result of human activities.
Recycle(ing)	Transforming waste materials into usable resources. For example, paper that we don't need anymore can be made into new paper.
Soil	The top layer of the earth's surface, made of rock and mineral particles mixed with organic matter. Dirt.
Waste	Any material (solid, liquid, or contained gas) that is discarded, recycled, reused, or considered inherently waste-like. Garbage.

Procedure:

Ahead of time: Place 1 cup of soil (in a container, but without a lid) and one bottle of water in each box. Close the box lid.

Step 1. Place one potted plant and the large rock on a table at the front of the class. Ask one student to come to the front and stand next to the plant and rock. Ask the rest of the class to identify which of the three items are living. Tell students you will be discussing what we need for living things to live.

Step 2. Ask students to brainstorm what things are necessary for life. Record the answers on the board.

Step 3. Circulate the boxes around the class (circulate until each child has looked in one box; the multiple boxes are just to save time). Ask each student to lift the lid, and note/record what is inside. Older students can make a list; younger students can draw a picture. After each student has examined the contents, he or she should close the lid and pass the box to the next student.

Step 4. Once all students have examined the boxes, ask them what they saw. Write their answers on the board. The answers will likely be soil/dirt, a bottle, water, and maybe the cup the soil is in.

Step 5. Tell the students the boxes contained more things (likely two more) than they listed.

Step 6. Repeat Steps 3 and 4. You want your students to come up with the answers of "air" and "light" in addition to the previous answers. You may need to steer them in this direction.

Step 7. Explain to the students that each box contains the four things necessary for life: air, water, soil/land, and light (actually, light only enters when they open the lid).

From here on, discussion questions alternate with procedure. Follow the order of questions/procedure as given.

Questions for Discussion 1 - 7:

Tailor your level of discussion and use of terminology to the age of your audience. When discussing things such as pollution and recycling, ask if they know what these are and be prepared to explain and provide examples, if necessary.

1. Bring the potted plant and student back to the front of the room. **Ask how each needs/uses clean air, water, land (soil), and sunlight. Discuss how/why each of these things is needed. See "Background" on page 2.** ***Answers may include:*** *Plants: need all four to grow and to make food (photosynthesis). Student: needs clean air to breathe, clean water to drink, clean soil/dirt/land to live and play on, and sunlight to keep warm and for light. Also needs all of these because she/he relies on plants (directly and indirectly) for food. (Fifth graders begin to learn about photosynthesis [using the term]; younger than that, explain basic needs [plants need these things to make food; all living things use this food] without going into terminology.)*

2. **Ask a few students what they ate for breakfast that day.** *Show the connection to plants for all food.*

3. **Are air, water, soil, and sunlight living things or nonliving things?** *Nonliving.*

4. **What do you think would happen if we didn't have sunlight?**
   Answers may include: plants couldn't grow (would die), plants couldn't "do" photosynthesis, plants couldn't supply food for us or other animals, it would be cold and dark, etc.

5. **What do you think would happen if we didn't have clean air?**
   Answers may include: plants couldn't make food (photosynthesis), so they wouldn't be able to supply food for us or other animals, it would be hard for people and animals to breathe, it could make us sick, it blocks out views, it stinks, etc.

6. **What do you think would happen if we didn't have clean water?**
   Answers may include: plants couldn't grow (they would die) or make food (photosynthesis), then they wouldn't be here to supply food for us or other animals, drinking dirty water makes us sick, dirty water stinks and looks bad, dirty water kills fish and other things that live in it, dirty water is no fun for swimming/wading/fishing/boating.

7. **What do you think would happen if we didn't have clean land (soil/dirt)?**
   Answers may include: plants couldn't grow (would die), because they couldn't get nutrients and minerals from the soil. Plants also need the soil to hold the water that they need so that their roots can access it. If plants die, they wouldn't be here to supply food for us or other animals. Dirty land/soil/dirt looks bad, dirty land can make water dirty.

Procedure, Cont.

Step 8. Tell students they are going to use some plants to observe what happens to them without clean air, water, soil, and sunlight. Get out the six plants. Invite one volunteer to the front to help with each plant (six volunteers total, one at a time).

Step 9. Explain what they will do with the plants. Have your volunteers do each of these things.

Pot 1: Will be well taken care of – appropriate sunlight, water, air, soil, etc. *Water plant, place in window (or wherever is appropriate in the classroom).*

Pot 2: Will be placed in a dark place with no sunlight, but will be watered, will get air, and has good soil. *Water plant, place in a dark place (e.g., a closet or cabinet).*

Pot 3: Will get sunlight, water, etc., but we're going to take away its soil. *Using paper towels and/or the plastic garbage bag, carefully remove the plant from the pot, dump the soil out, and remove the soil from the plant roots. Fill the pot ½ full of gravel and plant the plant; add remaining gravel. Water and place in window (or wherever) with Pot 1.*

Pot 4: Will get sunlight and was planted in good soil and will be watered, but will be sealed in plastic bag so it doesn't get any air. *Water and seal in bag (expel all air first); place in window (or wherever) with Pots 1 and 3.*

Pot 5: Will get sunlight, etc. and has good soil, but won't get any water. *Place in window (or wherever) with Pots 1, 3, and 4.*

Pot 6: Wait to discuss until after Question 8.

As you do this, ask students what they think will happen to each and why.

Questions for Discussion, Cont.:

8. Ask students if they know what pollution is. Discuss/explain, if necessary. **Do we want our air, water, and soil/land to be polluted?** ***NO!*** **How do air, water, and soil get polluted?** *Answers may include: littering; car exhaust; factories; pouring things (chemicals) into the water, on the ground, or down storm drains; not picking up after pets; throwing things away instead of recycling or reusing, etc. Be sure items related to water pollution – especially pouring things (e.g., soda, motor oil, etc.) on the ground/into water/down storm drains – gets discussed.*

Procedure, Cont.

Step 10. Pot 6. Will get sunlight, air, soil, and liquid to drink, but instead of clean, clear water, we are going to "water" this plant with vinegar. It looks just like clean, clear water, but it's definitely not! **Do people drink or eat vinegar?** While we use some types of vinegar in small quantities for cooking or on salads or French fries (balsamic vinegar), we usually don't drink or eat distilled white vinegar directly. *Also point out that the vinegar can represent many types of pollutants in water in the environment.* **Should plants drink vinegar? What will happen to this plant? Why? Is polluted water (or air or soil) better than no water/air/soil at all? How could water in "real life" get polluted?** *Water the plant with vinegar and place in window (or wherever).*

Questions for Discussion, Cont.:

9. **What can you (a kid) do to help make sure we have clean air? Clean water? Clean land/dirt/soil?**
   Potential Answers:
   Air: Don't ask mom or dad to drive you in the car; walk, ride your bike, take the bus, or ride with a friend (carpool). Ask mom and dad to turn off the car engine when waiting to pick you up. Plant a tree. Remind mom and dad to do all their errands in one trip. Remind mom and dad to not burn garbage.
   Water: Don't put/pour litter or liquids (like soda or motor oil) on the ground, in streams, lakes, etc. or down storm drains. Be nice to plants growing near streams (don't pull up, run over, etc.) to prevent erosion. Plant trees or other plants near streams. Remind mom and dad to not use more lawn chemicals than they need. Pick up after my dog. Pick up my litter and other people's.
   Land: Pick up my litter and other people's. Recycle (cans, paper, plastic, bottles, etc.). Reuse items (e.g., use the back of old paper for drawing). Use both sides of paper. Ask mom and dad to buy recycled things. Give away old toys, etc. (to charity, friends, siblings) instead of throwing them away. Use things that can be used again (e.g., use a lunch box instead of a new lunch sack each day).

Procedure, Cont.

Step 11. Have students compare the plants as the days go by and focus again on needs. **What is living? Living, but looking sick? Dying?** If things do not grow as they should (that is, the pampered plant dies and/or another plant thrives), use that to segue into "why?": needing things in the correct quantities and conditions (that is, it got sunlight, water, etc., but maybe too much or not enough of something), adapt to changing environments, etc.

Don't forget to water the plants (except Pot 5) as necessary. When watering Pot 4 (no air), unseal bag and quickly water, then expel air from bag and quickly re-seal. Remember to "water" Pot 6 with vinegar. Use the pampered plant as a guide of when to water the other plants/gauge their light needs, etc. (for example, if the pampered plant appears to be getting too much light, move it and move the other plants too [except Pot 2] to keep the other plants from dying from causes other than the intended ones.

Assessment/Follow-Up:

- Complete "Questions for Discussion," above.
- Have students draw pictures or make posters showing the four essential things needed for life.
- Have students individually observe the plants on a regular schedule and record their observations, then report on what happened and why. (This is different than Step 11, which is a more informal class discussion.) Expand this more by having students take photos of the plants and create displays or posters showing what happened.
- Complete "DEQ Kids: Who is Protecting Idaho's Clean Air, Land, and Water?" Available for download at http://www.deq.idaho.gov/air/educ_tools.cfm, Student Resources or by calling 208-373-0478. (DEQ regional office employees – get from your office's publications coordinator; state office employees, get from Leslie Nelson, x0383.)
- Have students make their own boxes (smaller amounts of dirt/water in smaller boxes works well). Have them decorate the outside with pictures of their favorite living things (e.g., pets, trees, grass, Dad, etc.), then their boxes home and challenge their families with the first half of the activity (Steps 1 – 7).

Additional Resources:

Air Quality in Idaho (links to air information on DEQ's Web site) http://www.deq.idaho.gov/air/index.cfm

DEQ Educational Tools: http://www.deq.idaho.gov/multimedia_assistance/educators_students.cfm

DEQ Kids Activity Booklet Series
- Do You Care About Air? http://www.deq.idaho.gov/air/educ_tools.cfm, Student Resources
- Let's Talk Trash... http://www.deq.idaho.gov/waste/educ_tools.cfm, Student Resources
- Water Does a Lot For Us…http://www.deq.idaho.gov/water/educ_tools.cfm, Student Resources
- Who is Protecting Idaho's Clean Air, Land, and Water…? http://www.deq.idaho.gov/air/educ_tools.cfm, Student Resources

Sun, Soil, Water, and Air. Songs for Teaching by the Banana Slug String Band.
http://www.songsforteaching.com/bananaslugstringband/sunsoilwaterair.htm

Waste (links to waste/land information on DEQ's Web site) http://www.deq.idaho.gov/waste/index.cfm

Water (links to water information on DEQ's Web site) http://www.deq.idaho.gov/water/index.cfm

What Does DEQ Do? http://www.deq.idaho.gov/about/deq_purpose.cfm

Have Questions or Need Help?

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